Physics- flipped

**Math- order of working - Please /excuse/ my/ dear/ aunt/ sally**

**Parenthesis/exponents/multiply/divide/add/subtract**

**This is what my course will look like in general**

Flipping it: there is some initial level of learning you are responsible for before showing up in class.

**Learning Before Class: Types of Assignments**

**Common pre-class assignments:** resources - textbook readings, pencasts, screencasts, multimedia video.

* **Mondays and Wednesdays** will be mostly clicker questions and white boarding or labs
  + Students work through examples in groups on whiteboards, wait until the majority of the groups are mostly done and then work through the example at the board with lots of their input, often generating clicker questions as we go.

**Friday will be mostly an assessment day.**

* Homework worksheets/assignments are due first thing,
* class will start with a **quiz,**
* A couple of students each week will have an oral assessment of some sort. (ask them, a week ahead- rubric (a 5 or 10-point scale that focuses on level of mastery)

**Friday Quizzes**

* Friday quizzes are usually given at the beginning of class and are marked for correctness
* Before the students start talking with one another, they use a mobile device to vote for their answer.
* After talking for a few minutes in your group, answer the question again (may turn in the group answer).
* Next, teacher will lead a discussion about the reasoning behind the answer.

**Quiz Corrections**

* For the quiz correction, students diagnose what went wrong and then generalize their new understanding of the physics involved.
* If they complete these assignments **in the way I have asked**, they earn back half of the marks they lost

**Pre-Class Online Participation Assignments and Grading from online work**

**Earn marks based on putting in an honest effort to explain the reasoning as opposed to choosing the correct answer**

* **1. Quizzes based on homework vary and are not marked for correctness (instead- completion & indications of effort to learn the material.**
* Questions and possible answers may be projected on a screen, given on worksheets, or on the website, )which are turned in online. They target recall or very basic understanding, not easy enough to guess without reading.
* Students are asked to answer at least a couple of hours before class, allowing the teacher time to review their answers, incorporating and adapting the lesson as needed

1. **Student-Generated Questions After Reading/Video –**

* Send any questions you have (e-mail or in box) regarding the clarification of the concepts or content.
* Questions with common themes will be addressed in class. For more isolated questions I usually respond via email.
* After completing the reading, generate questions to be covered in class

1. **Writing** –
   * **Summaries** -Write a paragraph or three summarizing the main ideas or understanding of the pre-class resources.
   * **Reflective Writing** - The purpose of the student writing is to focus on the ideas that you are having trouble understanding and to highlight or summarize those ideas through your writing. (This type of assignment is marked for completion and evidence that you were writing for their own understanding- it is not marked for correctness.
2. **Simulation-based pre-class assignment:**

* Play around with a simulation for 5-10 minutes before answering questions. (e.g., “explore all things that affect the simulation”.
* Generate 2-3 questions or screenshots of “cool things”
* Generate 3 items of interest — these could be any combination of questions that you have, interesting observations that you made or descriptions of things that the simulation made really clear to you that you didn’t quite get before

**What does constructive Criticism look like to you?**

**Flipping/Inverting the classroom**

**Reading assignments and other “learning before class” assignments**

When implementing “read the text before class” or any other type of “learn before class” assignments, you have to establish **what exactly you want the students to get out** of these assignments. Determine what I would realistically expect an average student to get from reading those sections before they came to class: vocabulary, simple and fundamental concepts, the easier examples and derivations. “Base ideas”.

Vocabulary and Jargon:

* **Back loading** vocabulary (teaching it after the concepts are in place) makes more sense when students are dealing with concepts that deal with everyday things or for which their intuition provides a basis upon which to build.
* **Frontloading** the vocabulary makes more sense in advanced courses where the concepts have no basis in everyday experience and where student intuition regarding the concepts and phenomena is not something that you want to build on.

**Teacher plan**

1. Make some short screencasts that present the base ideas and try to put a framework or narrative around them to make them look like a cohesive set of fundamental ideas that can be built on.
2. Pull student answers and questions into the lecture material.
3. I will use their words in place of my own as much as possible or present their questions to motivate something we were already going to discuss or do.
4. If most of the people nailed the question in the pre-lecture assignment, I usually skip the question in class and move on to a more challenging question on the same concept or one that builds on the question from the pre-lecture assignment.
5. Assign reading
6. Homework/classwork Questions-Three possible answers to the question are projected on a screen. These questions are either directly from the book or are easy clicker questions
   1. (For the clicker questions I ask them explain their reasoning in addition to simply answering the question.)
   2. Get them to submit via email
   3. **always responded to each and every one of their answers,**
   4. Give them some sort of credit for each question in which they made an effortful response
   5. **even if it was nothing more than “great explanation” for a correct answer**
   6. I respond help clear up any mistakes in their thinking
   7. I use a healthy dose of copy and paste

4. Give them 3-5 questions that ask them to wrestle with these base ideas.

1. These easiest questions typically force the students to deal with the new vocabulary and get a chance to apply the fundamental concepts to reasonably simple situations.
2. They are much like the “check your understanding” questions typically found at the end of a section from any recent intro physics textbook.
3. Other options for these questions are ones that ask the students to go one step beyond what was presented in an example or to fill in a critical step in the reasoning process in a derivation.
4. These assigned **questions always require both an answer and an explanation** of the answer and are submitted the evening before class. In order to get credit the students do not need to be correct, but their answers need to demonstrate that they put in an honest effort to figure out the answer to the question.
5. There will also always be a “what question do you still have after completing the rest of this pre-lecture assignment?” question.

**smartPhysic**s

* SmartPhysics consists of online homework, online pre-class multimedia presentations and a shorter than usual textbook because there are no end-of-chapter questions in the book,
* **The smartphysics online homework-** The Interactive Examples tend to be fairly long takes the student through multiple steps of qualitative and quantitative analysis to arrive at the final answer
* Students are supposed to first read the assignment very carefully then write a paragraph, trying to **zero in on what they don‘t understand**, and all points that they would like to be clarified during the class using underlining, highlighting and/or summarizing the textual extract. (“Write about what it means.” Try and find out exactly what you don‘t know, and try to understand through your writing the material you don‘t know.)

**Clicker question resources**: My two favorite resources for intro physics clicker questions are:

* The Ohio State clicker question sequences and,
* The collections put together by the folks at Colorado.

**Clicker-based examples:**

• For a typical example, I will identify 2-4 points in the example that would cause them some grief if they tried to do the example completely on their own. When I work this example at the board (or on my tablet) I will work through the example as usual, but when I get to one of the “grief” points I will pose a clicker question. These clicker questions might be things like “which free-body diagram is correct?”, “which of the following terms cancel?” or “which reasoning allowed me to go from step 3 to step 4?”

• The other end of the spectrum is that I give them a harder question and still identify the “grief” points. But I instead get them to do all the work in small groups on whiteboards. I then help them through the question by posing the clicker questions at the appropriate times as they work through the problems. Sometimes I put all the clicker questions up at the beginning so they have an idea of the roadmap of working through the problem.

**Standards-Based Feedback** - students would not receive standards-based grades throughout the term but would instead produce a portfolio of their work which best showed their mastery for each standard.